selecting one of an X-basis and a Z-basis for distributing the quantum key;

in response to selection of the Z-basis, performing at least one of:

delaying a first pulse of light propagating in the first ring resonator to create the quantum key in a $|0\rangle$ state in the Z-basis; and

delaying the first pulse of light propagating in the first ring resonator to create the quantum key in a $|1\rangle$ state in the Z-basis; and

in response to selection of the X-basis, performing at least one of:

delaying the first pulse of light propagating in the first ring resonator with respect to a second pulse of light propagating in the second ring resonator to constructively interfere the first pulse of light with the second pulse of light so as to create the quantum key in an $|+\rangle$ state in the Z-basis; and

delaying the first pulse of light propagating in the first ring resonator with respect to the second pulse of light propagating in the second ring resonator to destructively interfere the first pulse of light with the second pulse of light so as to create the quantum key in an $|-\rangle$ state in the Z-basis.

15. The method of claim **14**, wherein selecting one of the Z-basis and the X-basis comprises randomly selecting one of the Z-basis and the X-basis.

16. The method of claim **14**, wherein modulating the first ring resonator comprises at least one of thermally modulating or electro-optically modulating the first ring resonator.

17. The method of claim **14**, further comprising:

propagating the first pulse of light in a propagation section of the output waveguide;

propagating the first pulse of light through at least one of the first ring resonator and the second ring resonator evanescently coupled to the propagation section of the output waveguide; and

coupling at least a portion of the first pulse of light back to the propagation section of the output waveguide.

18. The method of claim **14**, wherein delaying the first pulse of light propagating in the first ring resonator comprises delaying a phase randomized attenuated laser pulse propagating in the first ring resonator.

19. The method of claim **14**, further comprising:

attenuating the quantum key to create a decoy state.

20. The method of claim **14**, wherein delaying the first pulse of light propagating in the first ring resonator with respect to a second pulse of light propagating in the second ring resonator comprises applying a π-phase shift to the second pulse of light with respect to the first pulse of light.

21. An apparatus for measurement-device-independent quantum key distribution, the apparatus comprising:

an input waveguide to guide an input pulse of light;

an output waveguide comprising:

a receiving section, evanescently coupled to the input waveguide, to receive the input pulse of light;

a propagation section to guide the input pulse of light received by the input section; and

a loop section having at least one segment evanescently coupled to the propagation section so as to couple at least a portion of the input pulse of light back to the propagation section; and

a first ring resonator evanescently coupled to the propagation section of the output waveguide;

a first modulator, operably coupled to the first ring resonator, to delay a first pulse of light propagating in the first ring resonator;

a second ring resonator evanescently coupled to the propagation section of the output waveguide; and

a second modulator operably coupled to the second ring resonator and having a first modulation mode and a second modulation mode,

wherein, in the first modulation mode, the second modulator delays a second pulse of light propagating in the second ring resonator so as to cause the first pulse of light to constructively interfere with the second pulse of light and, in the second modulation mode, the second modulator delays the second pulse of light so as to cause the first pulse of light to destructively interfere with the second pulse of light.

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